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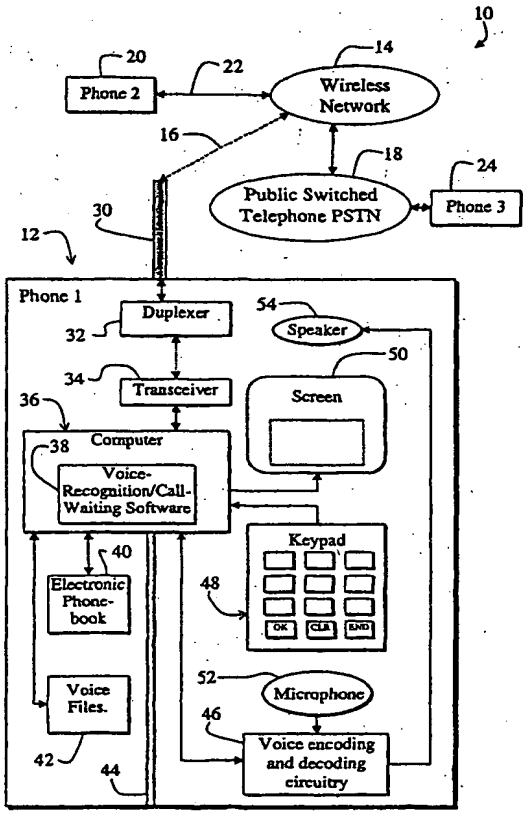
(54) Title: SYSTEM AND METHOD FOR ENHANCING CALL WAITING FUNCTIONALITY VIA VOICE RECOGNITION



(57) Abstract: A system (12, 36, 38) for enhancing call-waiting functionality of a communications device (12) with voice-recognition capabilities of the present invention. The system (12, 36, 38) includes a first mechanism (36, 38) for storing acoustic commands and acoustic messages (42) associated with entries in a database (40). A second mechanism (38) selectively retrieves the acoustic messages (42) and/or responds to user voice commands corresponding to the acoustic commands (42) in response to a call-waiting signal. In a specific embodiment, the electronic device (12) includes a wireless phone (12). The database (40) is an electronic phonebook (40). The second mechanism (38) provides a phone number corresponding to an incoming call associated with the call-waiting signal, via a caller identification systems and methods. The second mechanism (38) also includes an additional mechanism (38) for searching the electronic phonebook (40) for entries matching the phone number associated with an incoming call and providing a signal in response thereto. Software (38) running on a computer (36) included in the communications device (12) includes a routine (38) for playing an acoustic message (42) based on the signal. The played acoustic message (42) is associated with matching electronic phonebook entry (40) if the signal indicates that the incoming phone number matches a phone number corresponding to the matching electronic phonebook entry (40). The message (42) is a default message if the signal indicates that the phone number does not match a phone number associated with an entry in the electronic phonebook (40).

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SYSTEM AND METHOD FOR ENHANCING CALL WAITING FUNCTIONALITY VIA VOICE RECOGNITION

BACKGROUND OF THE INVENTION

Field of Invention:

This invention relates to telecommunications systems. Specifically, the present invention relates to systems and methods for handling call-waiting signals in both landline and wireless telephones.

Description of the Related Art:

Systems and methods for efficiently handling call waiting signals are particularly desirable in wireless phones, which are employed in a variety of demanding applications ranging from search and rescue to business applications. Such applications often demand feature-rich wireless phones that can efficiently handle call-waiting signals with minimal user interruption.

Call-waiting service allows a wireless phone user to receive and answer an incoming call while on another call. Such features are important when a user is expecting an important call. Currently, if the user is on another call and receives an incoming call, a call-waiting beep notifies the user of the incoming call. If the network and the phone support caller identification, the phone number of the incoming call is displayed on a wireless phone display screen. The user may then observe the incoming phone number and make a decision to answer or not answer the call based on the phone number. A flash or send button is typically pressed to answer the call. Hence, the user must move the wireless phone from the ear, look at the display screen, make a decision about whether or not to answer the call based on the phone number, press send or flash, or return to the original call. Unfortunately, this sequence of steps is often time-consuming, inefficient, awkward, and is unnecessarily disruptive.

Currently, a trend exists in the wireless communications industry toward wireless phones with voice-recognition capabilities. However, existing phones with

voice-recognition capability fail to effectively utilize voice recognition to improve phone call-waiting functionality.

Hence, a need exists in the art for a system and method for employing wireless phone voice recognition capability to improve phone call-waiting functionality, thereby obviating the need for the inefficient and awkward sequence of steps currently required for a user to address a call-waiting signal.

SUMMARY OF THE INVENTION

The need in the art is addressed by the system for enhancing call-waiting functionality of a communications device of the present invention. In the illustrative embodiment, the inventive device is equipped with voice recognition capabilities. The system includes a first mechanism for storing acoustic commands and acoustic messages associated with entries in a database. A second mechanism selectively retrieves the acoustic messages and/or responds to user voice commands corresponding to the acoustic commands in response to a call-waiting signal.

In a specific embodiment, the electronic device includes a wireless phone. The database is an electronic phonebook located inside the phone or at the network side. The second mechanism includes a mechanism for providing a phone number corresponding to an incoming call associated with the call-waiting signal, which is implemented via a caller identification systems and methods. The second mechanism also includes a mechanism for searching the electronic phonebook for entries matching the phone number associated with an incoming call and providing a signal in response thereto. Software running on a computer included in the communications device includes a routine for playing an acoustic message based on the signal.

If the signal indicates that the incoming phone number matches a phone number corresponding to the matching electronic phonebook entry, then the played acoustic message is associated with matching electronic phonebook entry. The message is a default message if the signal indicates that the phone number does not match a phone number associated with an entry in the electronic phonebook.

The novel design of the present invention is facilitated by the second mechanism, which enables the use of voice commands to respond to call waiting signals, thereby obviating the need for undesirable and often awkward sequences of

manual steps required to handle call-waiting signals. Furthermore, the second mechanism enables phones equipped with the system of the present invention to efficiently acquire additional information about the incoming call, such as the name of the caller associated with the incoming call. This is particularly desirable for users that receive many calls and do not remember callers' phone numbers, yet would like to screen calls.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram of an exemplary communications system constructed in accordance with the teachings of the present invention and illustrating a call-waiting scenario.

Fig. 2 is flow diagram of software running on the wireless phone of Fig. 1 for enhancing call-waiting functionality via phone voice recognition capabilities.

Fig. 3 is a diagram of a voice recognition system constructed in accordance with the teachings of the present invention adapted for use with a wireless phone.

Fig. 4 is a flow diagram of method implemented via the voice recognition system of Fig. 3.

DESCRIPTION OF THE INVENTION

While the present invention is described herein with reference to illustrative embodiments for particular applications, it should be understood that the invention is not limited thereto. Those having ordinary skill in the art and access to the teachings provided herein will recognize additional modifications, applications, and embodiments within the scope thereof and additional fields in which the present invention would be of significant utility.

Fig. 1 is a diagram of an exemplary communications system 10 constructed in accordance with the teachings of the present invention and illustrating a call-waiting scenario. The communications system 10 includes a first wireless phone 12 that is connected to a code division multiple access (CDMA) wireless network 14 via a first wireless link 16. The wireless network 14 is connected to the Public Switched Telephone Network (PSTN) 18, which is also known as the landline network. A second

wireless phone 20 is connected to the wireless network 14 via a second wireless link 22. A third landline phone 24 is connected to the PSTN 18.

The first wireless phone 12 includes an antenna 30 that is connected to a duplexer 32. The duplexer 32 is connected to a transceiver 34, which is connected to a computer 36 running voice-recognition and call-waiting software 38 constructed in accordance with the teachings of the present invention. The computer 36 is connected to an electronic phonebook 40 and a memory containing voice files 42. The computer 36 is also connected to a data interface adapter 44, voice-encoding/decoding circuitry 46, a keypad 48, and a screen 50. The voice-encoding/decoding circuitry 46 is connected to a microphone 52 and a speaker 54. For clarity, additional circuitry such as clocking circuitry and power supplies are not shown in the wireless phone 12, but those ordinarily skilled in the art will know where and how to include the requisite additional circuitry. Also for clarity, the electronic phonebook 40 and the voice files 42 are shown separately from the computer 36, but in practice, the voice files 42 and the electronic phonebook 40 are preferably implemented in software and stored in computer memory (not shown).

In operation, the antenna 30 transmits and receives signals via the duplexer 32. The duplexer 32 facilitates sharing of resources of the antenna 30 between transmit and receive functions. The transceiver 34 includes transmit circuitry for transmitting signals such as encoded voice signals or service negotiation signals via the antenna 30 and duplexer 32. The transceiver 34 also includes receive circuitry for receiving signals, such as service negotiation messages or encoded voice signals, from another phone, base station, or mobile switching center (not shown) via the wireless network 18. The transceiver 34 also includes downconversion circuitry required to convert receive signals to digital baseband signals in preparation for processing via the computer 36. In addition, the transceiver 34 includes upconversion circuitry required to convert transmit signals from digital baseband signals to radio frequency signals in preparation for transmission via the antenna 30.

A user may initiate a call by dialing a number via the keypad 48. The computer 36 negotiates a service connection with an available wireless service provider associated with the wireless network 18 via the transceiver 34, the duplexer 32, and the antenna 30. When service is established, voice, data or fax information is transferred over the air interface link 14. For a voice call, the user's voice is input to the microphone 52,

encoded by the voice-encoding/decoding circuitry 46 and transmitted via the computer 36, transceiver 34, duplexer 32, and the antenna 30. Similarly, received voice messages are decoded by the voice-encoding/decoding circuitry 46 and as voice via the speaker 54. The data interface adapter 44 allows software running on the computer 36 to be upgraded and/or changed. The data interface adapter 44 also facilitates employing the wireless phone 12 as an external modem for an external computer (not shown). In this case, modem software runs on the computer 36 and/or on the external computer and facilitates communications with the external computer. Such modem software is known in the art and may be developed or purchased by one ordinarily skilled in the art.

In the present embodiment, the computer 36 runs the unique voice-recognition and call-waiting software 38, which is constructed in accordance with the teachings of the present invention. The voice-recognition and call-waiting software 38 enables a user of the wireless phone 12 to record names or other voice messages in the voice files 42 and associate the stored names with entries in the electronic phonebook 40. The user may also record commands such as "Answer" or "No". The recorded acoustic files 42 may then be compared as needed to voice input from the microphone 52 by the software 36 to generate appropriate software responses as discussed more fully below. Hence, the voice files 42 contain acoustic files that are indexed in accordance with entries in the electronic phonebook 40 in addition to command files which are selectively compared to voice commands input via the microphone 52.

The unique voice-recognition and call-waiting software 38 monitors the wireless phone 12 for the receipt of a call waiting signal or message. When a call waiting signal is received while the wireless phone 12 is on another call, the software 38 compares the caller identification (caller ID) of the incoming call associated with the call-waiting signal with entries in the phonebook and plays an appropriate message through the speaker 54 if a match is found or if a match is not found. The acoustic message indicates to the user that an incoming call was detected and gives the name of the incoming caller if the incoming caller is found in the electronic phonebook 40 and has an associated pre-recorded voice file contained in the voice files 42. The associated voice file typically contains the name of the incoming caller.

One system and method for efficiently matching incoming calls to entries in an electronic phonebook is disclosed in co-pending U.S. Patent Application Serial No. 09/469,059, attorney docket number QCPA990191 filed concurrently by K.

Chinaswami, entitled SYSTEM AND METHOD FOR MATCHING CALLS TO ELECTRONIC PHONEBOOK ENTRIES, assigned to the assignee of the present invention and incorporated by reference herein.

In the exemplary call-waiting scenario of Fig. 1, the first wireless phone 12 is currently maintaining a call with the second wireless phone 22 via the wireless network 14. The first wireless link 16 and the second wireless link 22 maintain traffic channels associated with the call in accordance with IS-95 telecommunications standards. While the call is in progress, the third landline phone 24 calls the first wireless phone 12, which is equipped with voice-recognition functionality, and the voice-enhanced call-waiting capabilities of the present invention as discussed more fully below.

The phone number of the third landline phone 24 is obtained by the first wireless pone 12 via caller identification systems and methods known in the art. The phone number is compared to phone numbers stored in the electronic phonebook 40. If a match is found, the special voice-recognition and call-waiting software 38 plays a message corresponding to a voice file stored in the pre-recorded voice files 42 that is associated with the matching phonebook entry. For example, if the incoming phone number is associated with the name Bob and the associated voice file stored in the voice files 42 contains the announcement "Bob", then the unique call-waiting software 38 plays the message "Incoming call from Bob". The user of the wireless phone 12 then issues an appropriate voice command, such as "Answer", and subsequently, the software 38 connects the user of the wireless pone 12 to Bob, who is calling form the third landline phone 24. The software selectively compares user-input received form the microphone 52 to voice commands stored in the voice files 42 and associated with certain functions, such as dropping the incoming call, putting the incoming call on hold, or ignoring the incoming call, as discussed more fully below.

Hence, while the first wireless phone 12 and the second phone (wireless or wireline) 20 are currently connected on a call, and the switch (not shown) associated with the call supports call-waiting, then the user of the first wireless phone 12 is notified of the incoming call via a pre-recorded message played through the speaker 54. When the caller ID associated with the incoming call is available, the switch (wireless network 14) sends the appropriate caller phone number, unless the caller ID is blocked. The caller ID message may be sent with an Alert with Information Message or a Flash with Information Message as defined in the IS-95 telecommunications standard, section

7.7.3.3 or 7.7.5 in the forward channel in the CDMA wireless network 14. Upon notification of the incoming call from an additional party, the user of the wireless phone 12 has an option to answer or not answer the call by issuing an appropriate voice command. Alternatively, the user may send a Flash with Information message to a base station (not shown) associated with the wireless network 14 by pressing an assigned key, such as an offhook key or a "SEND" button that is generally used for call originations. The software 38 enables the first wireless phone 12 to match the phone number of the incoming caller to any number that has been stored in the electronic phonebook 40. If the phone number matches a pre-stored number in the electronic phonebook 40, the software 38 notifies the user that an incoming call has been received by announcing, for example, "Incoming call from restricted number", if the number is a restricted number. This message is played until the call is answered of for 2 times at the beginning. Subsequent reminders are implemented via standard call-waiting beeps in accordance with IS-95 standards (Section 7.7.5.5). A user may also answer or reject the incoming call by speaking out a pre-stored acknowledgement, such as "Yes", "Answer" "No", "Hold", and so on.

Those skilled in the art will appreciate that software systems for storing voice files and retrieving voice files from a computer are known in the art and may be employed in the present invention. Some existing phones have a Voice Recognition mode, which enables a user to store voice files and associate the voice files with entries in an electronic phonebook. However, existing phones do not have an efficient mechanism for handling call-waiting signals, a need which is met by the present invention.

The ability of the wireless phone 12 to handle call-waiting signals via acoustic voice commands, unlike prior phones, is particular useful to users employing headset adapters or hands-free adapters, such as in automotive car kits, or at night when the display screen 50 is not clearly visible due to the backlight being off. Backlight features are commonly turned off to conserve battery life.

Fig. 2 is flow diagram of software 38 running on the wireless phone 12 of Fig. 1 for enhancing call-waiting functionality via phone voice recognition capabilities. With reference to Figs. 1 and 2, When the wireless phone 12 is connected with another phone, such as the second wireless or wireline phone 20 and a call is in progress, control is passed to an initial monitoring step 62.

The initial monitoring step 62 monitors the phone 12 for the receipt of a call-waiting signal associated with an incoming call. When a call-waiting signal is received, control is passed to a caller ID step 64.

The caller ID step 64 checks the phone number of the incoming call via caller ID systems and methods known in the art. If the phone number of the incoming call is detected, then control is passed to a comparing step 66, otherwise control is passed to a first announcing step 68. The first announcing step 68 plays a default message associated with an acoustic file stored in the recorded files 42, which is output via the speaker 54, indicating to the user that an incoming call from a restricted number was detected. An exemplary message is "Incoming call from restricted number."

The comparing step 66 compares the incoming phone number with phone numbers in the electronic phonebook 40 to find a match. If a matching entry in the electronic phonebook 40 is found, then control is passed to a second announcing step 70. Otherwise, control is passed to a third announcing step 72.

The second announcing step 70 plays a pre-recorded message stored in the recorded files 42 associated with the matching phonebook entry. For example, if the matching number in the phonebook corresponds to Bob, then an acoustic file announcing the receipt of an incoming call from Bob is played. An exemplary message is "Incoming call from Bob." The acoustic file is previously stored and may be edited by the user via a predetermined sequence of commands and user-input, which are application-specific and easily determined by one skilled in the art to meet the demands of a given application.

The third announcing step 72 plays a default message indicating the receipt of an incoming call from an unknown caller. An exemplary message is "Incoming call from unknown caller." Alternatively, the third announcing step 72 may play a message which announces that an incoming call was received, and subsequently announces the phone number corresponding to the incoming call. In this case, the words associated with each number 0 through 9 are stored in the recorded files and selectively retrieved and played through the speaker 54 based on the phone number of the incoming call. Exact software implementation details for implementing step 72 and associated features may be easily developed by those skilled in the art with access to the present teachings.

Once the appropriate messages have been announced in the first announcing step 68, the second announcing step 70, or the third announcing step 72, control is passed to

an input-retrieval step 74. The input-retrieval step 74 listens, for a first predetermined time interval, for a user response to the previous announcement played in steps 68, 70 , or 72. If the predetermined time interval elapses with no user input, acoustic or otherwise, control is passed to a fourth announcing step 76.

The fourth announcing step 76 re-plays the previously announced message and then listens for a user response for a second predetermined time interval. The first and second predetermined time intervals associated with the listening step 74 and the fourth announcing step 76, respectively, are application-specific and easily determined by one ordinarily skilled in the art to meet the needs of a given application.

If the second predetermined time interval elapses with no user response detected, then control is passed to a standard call-waiting step 78, where a standard call-waiting beep is played in accordance with IS-95 telecommunications standards and the software 38 is complete. If the user indicates, via a voice-command or other user-input, not to answer the incoming call, then control is passed to a disable step 80, where call-waiting alerts and associated beeps and messages are temporarily disabled for that particular incoming call, and the software 38 is complete. If the user indicates, via a voice-command or other user-input, to answer the incoming call, then control is passed to a connecting step 82 where the user of the wireless phone 12 is connected to the incoming caller and the software 38 is complete.

If in the listening step 74, the user indicates, via a voice command or otherwise, not to answer the incoming call-waiting call, then control is passed to the disable step 80. If the user indicates to answer the call, such as by saying "Answer" if "Answer" is an appropriate and pre-recorded voice command, then control is passed to the connecting step 82. If the user responds, but the response is not recognized, then control is passed to a fifth announcing step 84.

The fifth announcing step 84 plays an acoustic message indicating that the user-response was not recognized and that the user may press certain keys to accept, decline, or repeat the previous user-response. An exemplary announcement is "Response not recognized. Repeat or press send to connect or cancel to ignore." If the user presses the send button in response to the above announcement, then control is passed to the connecting step 82. If the user presses the cancel button, then control is passed to the disable step 80. If the user repeats the user-response, then control is passed to the listening step 74 upon the detection of voice input.

Those skilled in the art will appreciate that an additional step for placing an incoming caller on hold in response to a predetermined user-input may be implemented in the software 38 without departing from the scope of the present invention. In addition, further steps, implemented via acoustic commands, may be may be employed in the software 38 for returning the user of the wireless pone 12 to the original caller When the newly connected caller hangs up.

Fig. 3 is a diagram of a voice recognition system 100 constructed in accordance with the teachings of the present invention adapted for use with a wireless phone. For clarity, various components, such as power supplies and clocks have been omitted from Fig. 3, however those skilled in the art will know how to obtain and implement the additional requisite components.

The system includes a programming key 102 in communication with a display 104 and a codec 108. A keypad 106 also communicates with the display 104 and the codec 108. An output of the microphone 52 is connected to the codec 108. An ouput of the codec 108 is connected to the speaker 54. The codec 108 is in communication with a digital signal processor (DSP) 114 that includes a voice recoding module 116, a spectrum analyzer 118, and a feature extraction module 120. An output of the DSP 114 is connected to an input of a decoder 126, an output of which is connected to a microprocessor 124. An output of the microprocessor 124 is connected to an input of an encoder 122, an output of which is connected to an input of the DSP 114. The DSP 114 is in communication with a memory 128 that includes a database storage area 130 and a software storage area 132.

In operation, the codec 108 facilitates the preparation of keypad, voice, and programming key inputs from the keypad 106, the microphone 52, and the programming key 102, respectively, for processing via the DSP 114 and the microprocessor 124. The codec 108 converts analog input signals from the microphone 52, programming key 102, and keypad 106 into digital signals for use by the DSP 114. Similarly, the codec 108 converts digital signals received from the DSP 114 to analog signals in preparation for output via the speaker 54.

The voice recording module 116 acts as a temporary memory for voice commands from the microphone 52. When in data entry mode, a user may record voice commands and associate the commands with a given action. For example, a user records the voice command "no", the word "no" is stored in the voice recording module

116 and subsequently delivered to the database 130 for more permanent storage. The software storage area 132 includes software for facilitating the retrieval of commands and phone book information from the database 130 and the storage of commands and phonebook information in the database 130.

When a user enters a voice command via the microphone 52, the command is temporarily stored in the voice recording module 116. The spectrum analyzer 118 then analyzes the spectrum of the voice command stored in the voice recording module 116, which will have a frequency between 0 and 4 kHz. The analyzed spectrum is then compared to or pattern matched with commands stored in the database 130. The commands with which the spectrum of the analyzed voice command is compared are selectively retrieved from the database 130 via the feature extraction module 120. The spectrum analyzer 118 correlates the spectrum of the received voice command with commands stored in the database 130 and selects the command yielding the largest correlation result. For example, if the voice command "yes" input by a user, the spectrum analyzer 118 analyzes the spectrum of the term "yes" by accessing the stored voice information in the voice recording module representing the term "yes". The spectrum is then compared to the spectrums of various commands stored in the database 130. The spectrum of the voice command stored in the database 130 that most closely matches the spectrum of the term "yes" is selected as the intended command. Those skilled in the art will appreciate that the DSP 114 may be implemented in the microprocessor 124 without departing from the scope of the present invention.

The database 130 in the memory 128 stores phonebook information that may be entered by a user via the keypad 100, the programming key 102, or the microphone 52 by a user.

When a user of the system 100 is on a call, and an incoming call-waiting signal is detected via the spectrum analyzer 118, and the caller ID of the incoming call is available, the feature extraction module 120 accesses the database 130 with reference to the caller ID to determine a voice file associated with the incoming call.

The DSP 114 subsequently plays back the voice file through the speaker 54 if the user has pressed the programming key 102 in response to a call waiting signal, and waits for voice commands in response thereto. The DSP 114 subsequently behaves in accordance with received voice commands or lack thereof. If no voice commands are received, the user is returned to the original call after a predetermined time-out period.

Fig. 4 is a flow diagram of method 140 implemented via the voice recognition system 100 of Fig. 3. With reference to Figs. 3 and 4, if the caller is on a voice call, as determined in an initial step 142, control is passed to a call-waiting step 144.

The call-waiting step 144 listens for an incoming call with caller ID as indicated via a call-waiting signal. If an incoming call without caller ID is detected, a generic voice announcement is played through the speaker 54 in a default announcement step 146. Otherwise, if an incoming call with caller ID is detected, control is passed to an ID-matching step 148.

In the ID-matching step 148, the caller ID of the incoming call is checked for matching entries in the database130. If a matching entry is found, control is passed to a playback step 150, where a voice message is played back the user specifying the name of the caller associated with the incoming call. Subsequently, control is passed to a command-checking step 152.

In the command-checking step 152, the system 100 listens for a user voice command or the reception of a signal indicative of an acknowledgement key being pressed, such as the programming key 102. If no user voice command or acknowledgement is detected, control is passed back to the call-waiting step 144. Otherwise, control is passed to a message-sending step 154. The message-sending step 154 sends a flash with information message to an associated base station or base station transceiver subsystem (not shown). The flash with information message directs the base station to connect the system 100 to the incoming call or to maintain the current call in accordance with the received user voice command or key input.

If in the call-waiting step 148 a call without caller ID is detected, or in the ID-matching step 148 no matching number is found in the database 130, then control is passed to the default announcement step 146. After the default announcement step 146, control is passed to an input-checking step 156.

In the input-checking step 156, the system 100 checks for the receipt of a voice command or keypad input. If no voice command or keypad input is detected during a predetermined time interval, control is passed back to call-waiting step 144. Otherwise, control is passed to the message-sending step 154, where an appropriate flash with information message is sent to an associated base station (not shown). Flash with information messages are known in the art. After the message-sending step 154, control is passed to an acknowledgement step 158.

In the acknowledgement 158, the system 100 waits for the reception of an acknowledgement message from the base station with which the system 100 is communicating indicating the reception of the flash with information message. Once the acknowledgement is received, the appropriate call is continued. The appropriate call is the call specified in the flash with information message sent to the base station in the message-sending step 154.

Thus, the present invention has been described herein with reference to a particular embodiment for a particular application. Those having ordinary skill in the art and access to the present teachings will recognize additional modifications, applications, and embodiments within the scope thereof.

It is therefore intended by the appended claims to cover any and all such applications, modifications and embodiments within the scope of the present invention.

Accordingly,

WHAT IS CLAIMED IS:

CLAIMS

1. A system for enhancing call-waiting functionality of a communications device with voice recognition capability comprising:

first means for storing voice information associated with entries in a database and

second means for selectively playing said voice information in response to a call-waiting signal.

2. The system of Claim 1 wherein said voice information includes acoustic commands and acoustic messages, and said second means includes means for selectively retrieving said acoustic messages and/or responding to user voice commands corresponding to said acoustic commands in response to said call-waiting signal.

3. The system of Claim 2 wherein said electronic device includes a wireless phone and said database is an electronic phonebook.

4. The system of Claim 2 wherein said second means includes means for providing a phone number corresponding to an incoming call associated with said call-waiting signal.

5. The system of Claim 4 wherein said means for providing a phone number includes telephone network equipped with caller identification equipment, said communications device adapted for use with caller identification systems.

6. The system of Claim 5 wherein said second means further includes means for searching said database for entries in said database matching said phone number corresponding to an incoming call and providing a signal in response thereto.

7. The system of Claim 6 wherein said second means further includes software running on a computer included in said communications device, said software including a routine for playing an acoustic message based on said signal.

8. The system of Claim 7 wherein said message is associated with a matching database entry if said signal indicates that said phone number matches a phone number associated with said matching database entry.

9. The system of Claim 8 wherein said message is a default message if said signal indicates that said phone number does not match a phone number associated with an entry in said database.

10. A system for enhancing call-waiting functionality of a communications device with voice recognition capability comprising:

first means for storing entries in an electronic phonebook, said entries associated with phone numbers and voice information;

second means for determining the phone number of an incoming call-waiting call;

third means for searching said entries in said electronic phonebook for an entry matching said phone number of said incoming call-waiting call and providing a match signal in response thereto;

fourth means for playing said voice information associated with said call-waiting call in response to said match signal;

fifth means for receiving a voice command from said user directing said communications device to connect to answer said call-waiting call or not to answer said call-waiting call; and

sixth means for implementing said voice command.

11. The system of Claim 10 wherein said first means includes a computer included in said communications device for converting voice entries into electronic format, and associating said voice entries with appropriate phone numbers in response to user voice commands.

12. The system of Claim 11 wherein said communications device is a wireless phone.

13. The system of Claim 12 wherein said second means includes a caller identification system.

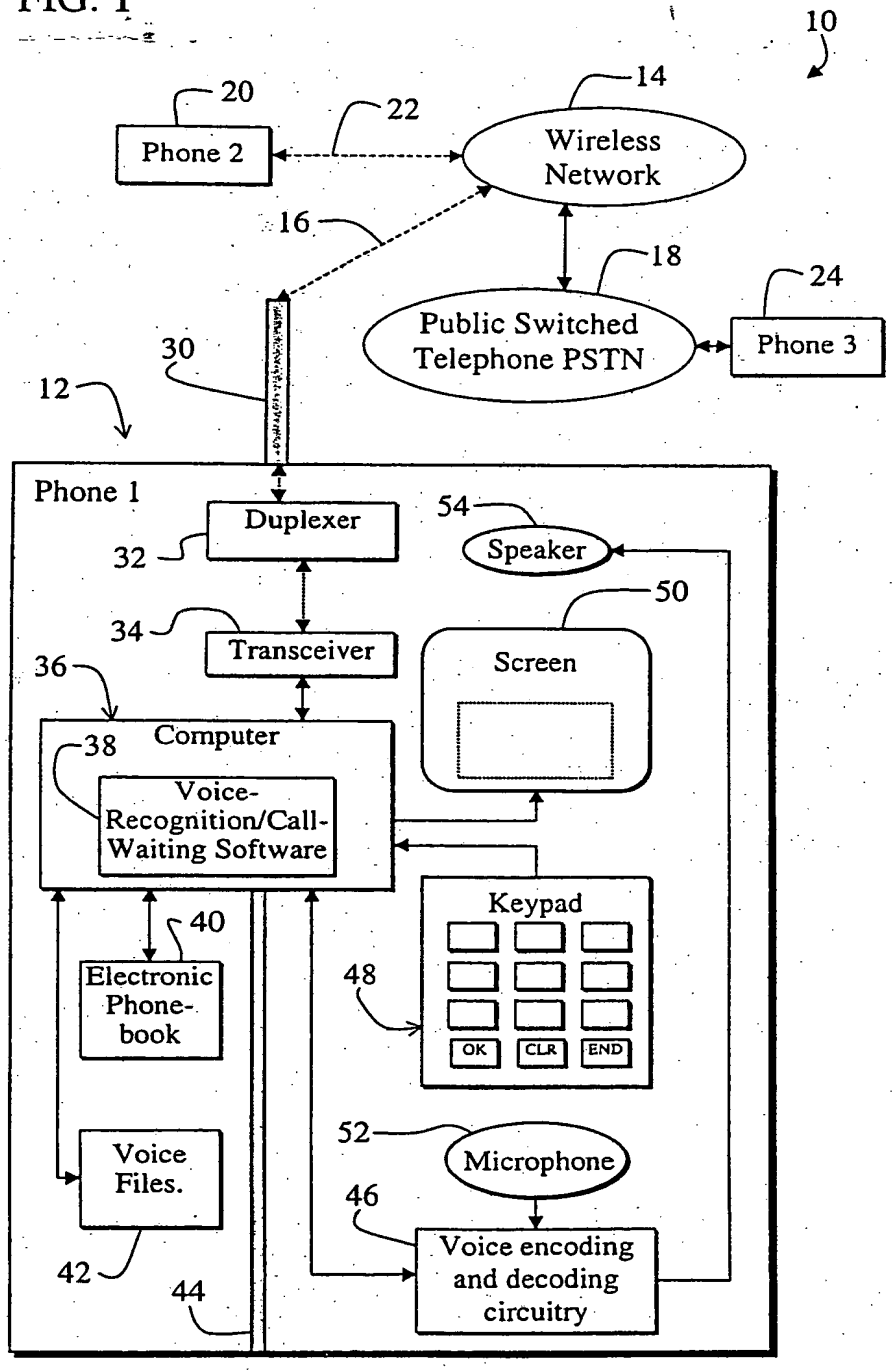
14. The system of Claim 13 wherein said third means includes a software routine running on said computer for comparing said phone number to said entries.

15 A method for enhancing call-waiting functionality of a communications device with voice recognition capability comprising the steps of:

storing acoustic commands and acoustic messages associated with entries in a database and

selectively retrieving said acoustic messages and/or responding to user voice commands corresponding to said acoustic commands in response to a call-waiting signal.

FIG. 1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14
20
22
Phone 2
Wireless Network
16
18
24
Public Switched Telephone PSTN
Phone 3
30
12
Phone 1
Duplexer
54
Speaker
32
50
34
Transceiver
Screen
36
Computer
38
Voice-Recognition/Call-Waiting Software
Keypad
40
Electronic Phone-book
48
OK
CLR
END
52
Microphone
Voice Files.
46
Voice encoding and decoding circuitry
42
44

FIG. 2

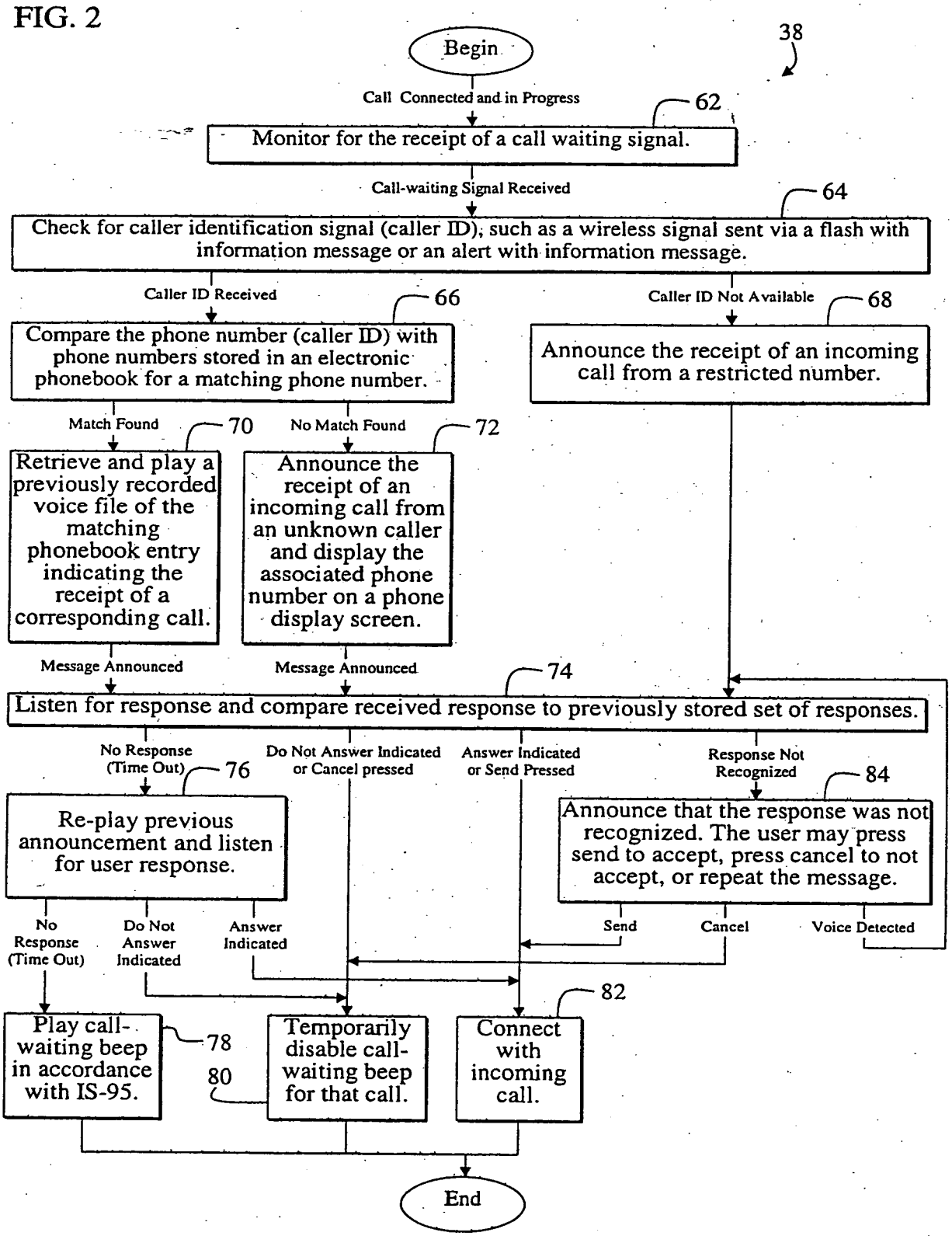

38
Begin
Call Connected and in Progress
62
Monitor for the receipt of a call waiting signal.
Call-waiting Signal Received
64
Check for caller identification signal (caller ID), such as a wireless signal sent via a flash with information message or an alert with information message.
Caller ID Received
66
Compare the phone number (caller ID) with phone numbers stored in an electronic phonebook for a matching phone number.
Caller ID Not Available
68
Announce the receipt of an incoming call from a restricted number.
Match Found
70
Retrieve and play a previously recorded voice file of the matching phonebook entry indicating the receipt of a corresponding call.
No Match Found
72
Announce the receipt of an incoming call from an unknown caller and display the associated phone number on a phone display screen.
Message Announced
Message Announced
74
Listen for response and compare received response to previously stored set of responses.
No Response (Time Out)
76
Re-play previous announcement and listen for user response.
Do Not Answer Indicated or Cancel pressed
Answer Indicated or Send Pressed
Response Not Recognized
84
Announce that the response was not recognized. The user may press send to accept, press cancel to not accept, or repeat the message.
No Response (Time Out)
Do Not Answer Indicated
Answer Indicated
Send
Cancel
Voice Detected
82
Play call-waiting beep in accordance with IS-95.
78
80
Temporarily disable call-waiting beep for that call.
Connect with incoming call.
End

FIG. 3

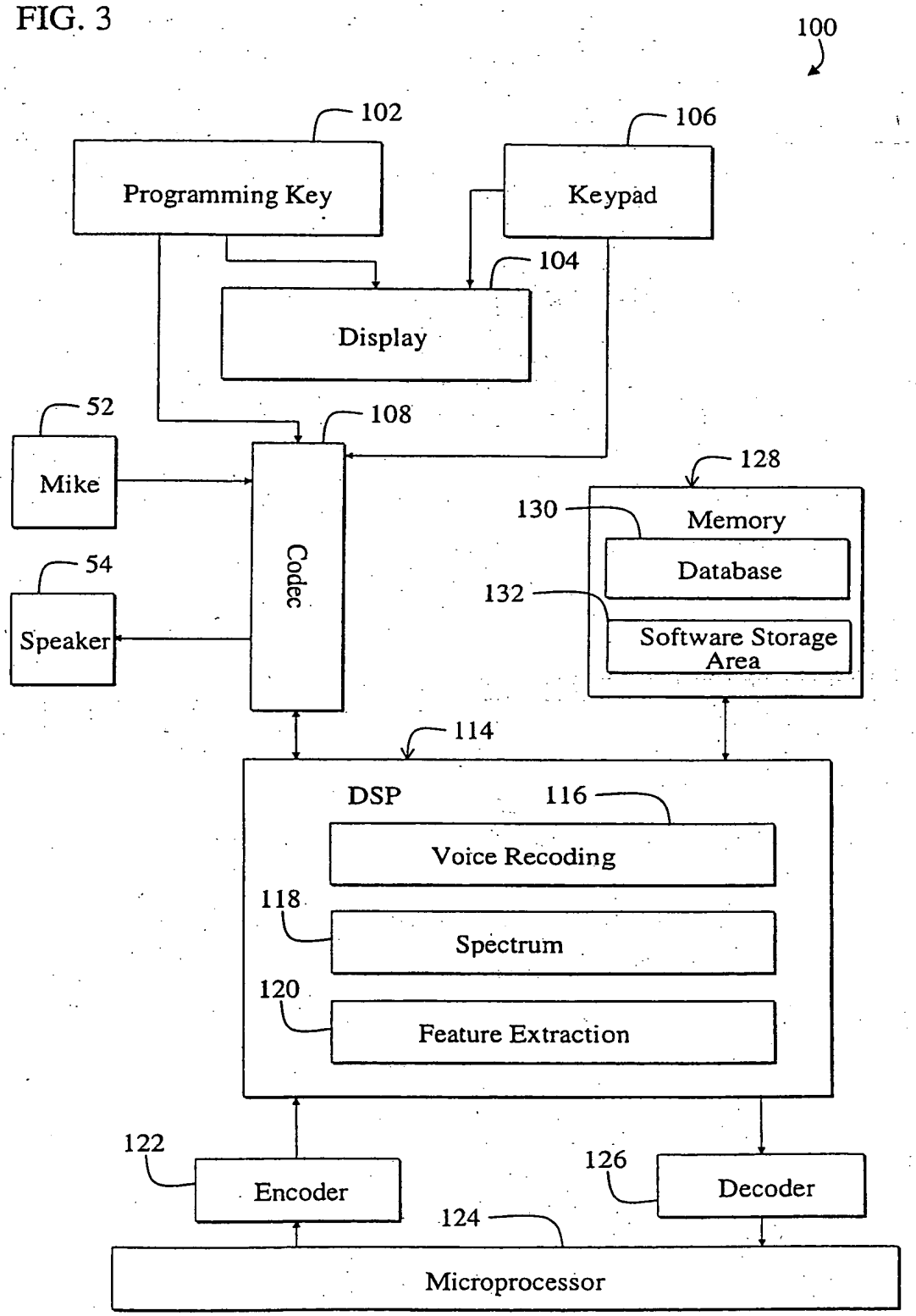
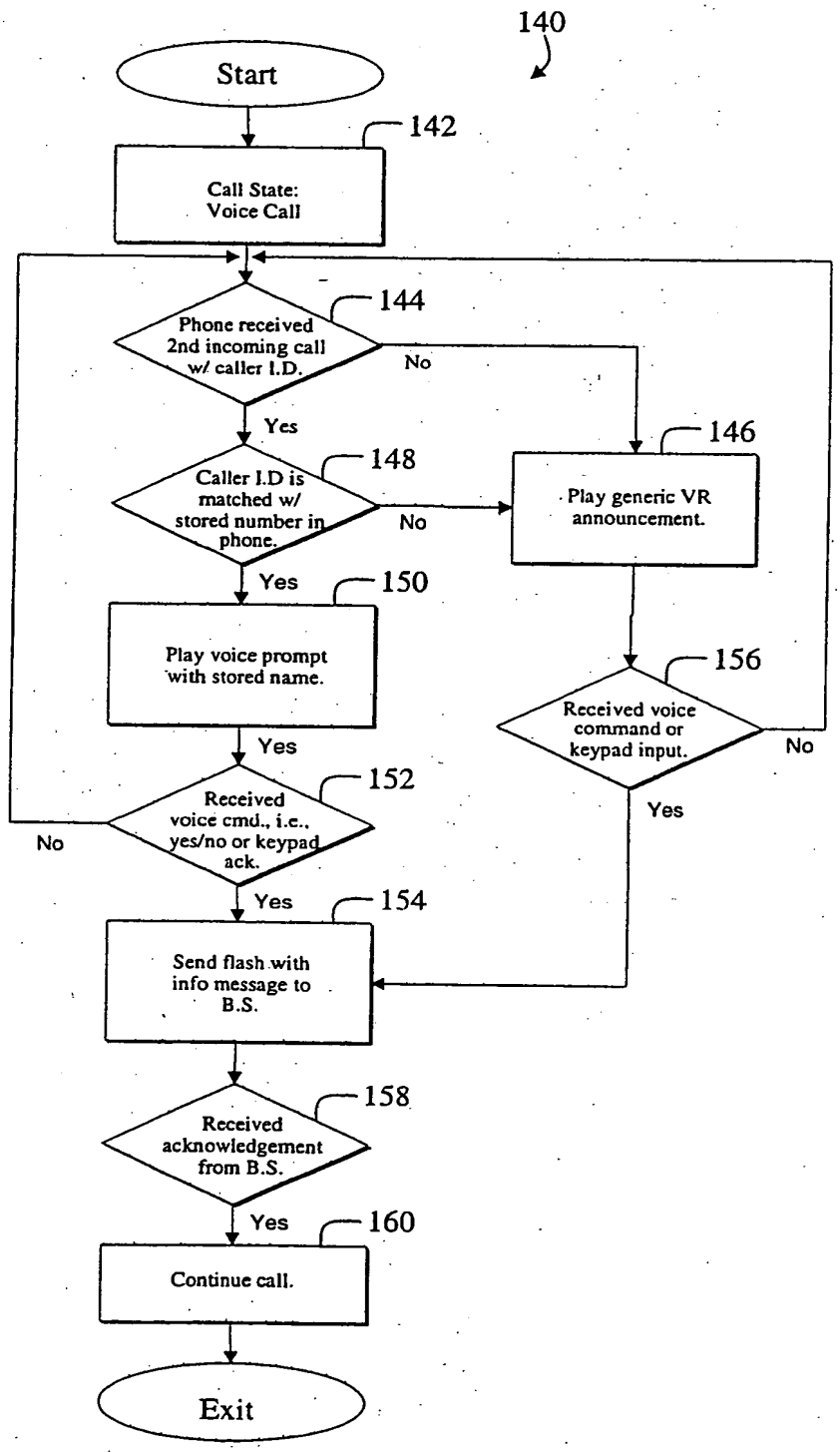

100
102
Programming Key
106
Keypad
104
Display
52
Mike
108
Codec
128
130
Memory
Database
132
Software Storage Area
54
Speaker
114
DSP
116
Voice Recoding
118
Spectrum
120
Feature Extraction
122
Encoder
126
Decoder
124
Microprocessor

FIG. 4


140
Start
142
Call State: Voice Call
144
Phone received 2nd incoming call w/ caller I.D.
No
Yes
146
148
Caller I.D is matched w/ stored number in phone.
No
Play generic VR announcement.
Yes
150
Play voice prompt with stored name.
156
Received voice command or keypad input.
No
Yes
Yes
152
Received voice cmd., i.e., yes/no or keypad ack.
No
Yes
154
Send flash with info message to B.S.
158
Received acknowledgement from B.S.
Yes
160
Continue call.
Exit